

Listing of Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claim 1. (original) A device for removing uremic toxins in a dialysis procedure comprising:

a body having an inlet and an outlet and defining an interior, the interior including a layer comprising urease, a layer comprising zirconium oxide, a layer comprising zirconium phosphate, and a layer comprising carbon; and

the device being so constructed and arranged so that a fluid entering the device contacts the zirconium phosphate layer upon entering the device before contacting the urease or the zirconium oxide layer.

Claim 2. (original) The device of claim 1 wherein the zirconium oxide has been modified to remove the nitrate ion.

Claim 3. (original) The device of claim 1 wherein the zirconium oxide is in hydroxyl form.

Claim 4. (original) The device of claim 1 wherein the carbon layer is located in juxtaposition to the outlet.

Claim 5. (original) The device of claim 4 wherein the fluid flows through a layer of zirconium oxide before entering the carbon layer.

Claim 6. (original) The device of claim 1 wherein the zirconium phosphate has a pH of approximately 2 to about 8.

Claim 7. (original) The device of claim 1 wherein the zirconium oxide has a pH of approximately 6 to about 13.

Claim 8. (original) The device of claim 1 including two separate layers of zirconium phosphate.

Claim 9. (original) The device of claim 1 including two separate layers of zirconium oxide.

Claim 10. (original) The device of claim 1 including an open header at each of the inlet and outlet end of the device.

Claim 11. (original) The device of claim 1 including an opening for venting a gas to the atmosphere located at the outlet end.

Claim 12. (withdrawn) A cartridge for use in a dialysis system for removing toxins comprising: a body having an inlet end and an outlet end; an interior including at least four layers, the layers including a first layer of a resin selected from the group consisting of zirconium phosphate having a pH of approximately 2.5 to about 5 and urease, a second layer of a resin selected from the group consisting of zirconium oxide having a pH of approximately 9 to about 13 and urease, a third layer of zirconium phosphate, and a fourth layer of zirconium oxide having a pH of approximately 6.5 to about 7.5; and the interior being so constructed and arranged that a fluid entering the interior from the first inlet end flows through the first layer, then the second layer, then the third layer, and then the fourth layer.

Claim 13. (withdrawn) The cartridge of claim 12 wherein the zirconium oxide has been modified to remove a nitrate ion and substitute bicarbonate ion therefor.

Claim 14. (withdrawn) The cartridge of claim 12 wherein the zirconium oxide is in hydroxyl form.

Claim 15. (withdrawn) The cartridge of claim 12 including a carbon layer located in juxtaposition to the outlet end.

Claim 16. (withdrawn) The device of claim 12 wherein the first layer comprises approximately 200 to about 800 grams of zirconium phosphate.

Claim 17. (withdrawn) The device of claim 12 wherein the fourth layer comprises approximately 50 to about 200 grams of carbon.

Claim 18. (withdrawn) The device of claim 12 wherein the urease is a cross-linked enzyme crystal urease.

Claim 19. (withdrawn) A device for regenerating a dialysis solution comprising: a body including a resin bed; and the resin bed including at least a layer of urease, zirconium phosphate, zirconium oxide, and carbon and being so constructed and arranged that a dialysis solution having a pH that is either basic or acidic will exit the cartridge after it passes through the resin bed at a pH of approximately 7 to about 7.8.

Claim 20. (withdrawn) The device of claim 19 wherein the first layer of the resin bed that the solution contacts is selected from the group consisting of zirconium phosphate having a pH of approximately 2.0 to about 5 and urease.

Claim 21. (withdrawn) The device of claim 19 wherein the second layer that the solution passes through in the resin bed is selected from the group consisting of zirconium oxide having a pH of approximately 9 to about 13 and urease.

Claim 22. (withdrawn) The device of claim 19 wherein the third layer of the resin bed that the solution contacts is zirconium phosphate.

Claim 23. (withdrawn) The device of claim 19 wherein the fourth layer of the cartridge that the solution contacts is zirconium oxide having a pH of approximately 6.8 to about 7.5.

Claim 24. (withdrawn) The device of claim 19 wherein the pH of the solution exiting the cartridge is approximately 7.4.

Claim 25. (withdrawn) The device of claim 19 wherein the first layer comprises approximately 200 to about 800 grams of zirconium phosphate.

Claim 26. (withdrawn) The device of claim 19 wherein the carbon layer removes less than 30 grams of glucose from a dialysis solution.

Claim 27. (withdrawn) The device of claim 19 wherein the urease is a cross-linked enzyme crystal urease.

Claim 28. (withdrawn) A device for use in a system for treating a patient with a dialysis solution comprising: an inlet in fluid communication with a source of dialysis solution; a body including the inlet and defining an interior and having an outlet; the body comprising a resin bed comprising a layer of urease, a layer of zirconium oxide, and a layer of zirconium phosphate that define a three layer structure; and the resin bed being oriented so that the first layer that the dialysis solution contacts of the three layer structure is either the urease or the zirconium phosphate layer and the zirconium oxide layer is so constructed and arranged that a basic or an acidic dialysis solution entering the inlet will exit the outlet with a physiologically acceptable pH.

Claim 29. (withdrawn) The device of claim 28 wherein the device is used in a regenerative dialysis system.

Claim 30. (withdrawn) The device of claim 28 wherein the first layer of the resin bed that the solution contacts is selected from the group consisting of zirconium phosphate having a pH of approximately 2.0 to about 5 and urease.

Claim 31. (withdrawn) The device of claim 28 wherein the second layer that the solution passes through in the resin bed is selected from the group consisting of zirconium oxide having a pH of approximately 9 to about 13 and urease.

Claim 32. (withdrawn) The device of claim 28 wherein the resin bed includes at least four layers.

Claim 33. (withdrawn) The device of claim 28 wherein the zirconium oxide layer has a pH of approximately 6.8 to about 7.5.

Claim 34. (withdrawn) The device of claim 28 wherein the pH of the solution exiting the cartridge is approximately 7.2-7.6.

Claim 35. (withdrawn) The device of claim 28 wherein the first layer comprises approximately 200 to about 800 grams of zirconium phosphate.

Claim 36. (withdrawn) The device of claim 28 including a layer of carbon that is selected so that it does not remove an excess amount of glucose.

Claim 37. (withdrawn) A method for constructing a cartridge for use in a system for providing dialysis comprising the steps of providing a resin bed including zirconium oxide and zirconium phosphate and selecting and orienting the layers of zirconium oxide and zirconium phosphate to allow the resin bed to remove uremic toxins present in a dialysis solution entering the resin bed and causing a dialysis solution exiting the cartridge to have a physiological pH and include a physiological acceptable electrolyte balance.

Claim 38. (withdrawn) The method of claim 37 including the steps of providing a body having an inlet and an outlet and defining an interior, the interior including a layer comprising urease, a layer comprising zirconium oxide, a layer comprising zirconium phosphate, and a layer comprising carbon; and the device being so constructed and arranged so that a fluid entering the device contacts the zirconium phosphate layer upon entering the device before contacting the urease on the zirconium oxide layer.

Claim 39. (withdrawn) The method of claim 37 wherein the zirconium phosphate has a pH of approximately 2 to about 8.

Claim 40. (withdrawn) The method of claim 37 wherein the zirconium oxide has a pH of approximately 6 to about 13.

Claim 41. (withdrawn) The method of claim 37 including two separate layers of zirconium phosphate.

Claim 42. (withdrawn) The method of claim 37 including two separate layers of zirconium oxide.

Claim 43. (withdrawn) The method of claim 37 wherein the resin includes approximately 200 to about 800 grams of zirconium phosphate.

Claim 44. (withdrawn) The method of claim 37 wherein the resin bed includes approximately 50 to about 200 grams of carbon.

Claim 45. (withdrawn) The method of claim 38 wherein the urease is a cross-linked enzyme crystal urease.

Claim 46. (withdrawn) A method for providing dialysis comprising the steps of passing a dialysis fluid through a body having an inlet and an outlet and defining an interior, the interior including at least four layers, a first layer comprising zirconium phosphate having a pH

of approximately 2.5 to about 5 or urease, a second layer comprising zirconium oxide having a pH of approximately 9 to about 13 or urease, a third layer comprising zirconium phosphate and a fourth layer comprising zirconium oxide having a pH of approximately 6.8 to about 7.5.

Claim 47. (withdrawn) The method of claim 46 wherein the fourth layer of the body that the solution contacts is zirconium oxide having a pH of approximately 6.8 to about 7.5.

Claim 48. (withdrawn) The method of claim 46 wherein the body includes two separate layers of zirconium oxide.

Claim 49. (withdrawn) The method of claim 46 wherein the zirconium oxide is in bicarbonate form.

Claim 50. (withdrawn) The method of claim 46 wherein the zirconium oxide is in hydroxyl form.

Claim 51. (withdrawn) The method of claim 46 wherein the body includes a carbon layer located in juxtaposition to the outlet end.

Claim 52. (withdrawn) The method of claim 46 wherein the first layer comprises approximately 200 to about 800 grams of zirconium phosphate.

Claim 53. (withdrawn) The method of claim 46 wherein the fourth layer comprises approximately 50 to about 200 grams of carbon.

Claim 54. (withdrawn) The method of claim 46 wherein the urease is a cross-linked enzyme crystal urease.

Claim 55. (withdrawn) A method of providing regenerative dialysis comprising the step of removing at least some uremic toxins by passing a dialysis fluid through a body having an inlet and an outlet and defining an interior, the interior including at least four layers, a first

layer comprising zirconium phosphate having a pH of approximately 2.5 to about 5 or urease, a second layer comprising zirconium oxide having a pH of approximately 9 to about 13 or urease, a third layer comprising zirconium phosphate and a fourth layer comprising zirconium oxide having a pH of approximately 6.8 to about 7.5.

Claim 56. (withdrawn) The method of claim 55 wherein the pH of the dialysis fluid as it exits the body is approximately 7.4.

Claim 57. (withdrawn) The method of claim 55 wherein prior to entering the body of the pH of the dialysis fluid is acidic.

Claim 58. (withdrawn) The method of claim 55 wherein prior to entering the body the pH of the dialysis fluid is basic.

Claim 59. (new) A device for removing uremic toxins in a dialysis procedure comprising:

a body having an inlet and an outlet and defining an interior, the interior including a layer comprising a modified urease selected from the group consisting of cross-linked enzyme crystals of urease, a blend of urease and zirconium oxide, and alumina-stabilized urease, a layer comprising zirconium oxide, a layer comprising zirconium phosphate, and a layer comprising carbon.

Claim 60. (new) The device of claim 59 wherein a fluid entering the device contacts the zirconium phosphate layer upon entering the device before contacting the modified urease or the zirconium oxide layer.

Claim 61. (new) The device of claim 59 wherein the body further comprises a rough interior surface, the rough interior surface preventing fluid flow along the interior surface.

Claim 62. (new) The device of claim 59 wherein the modified urease is an irradiated modified urease.

Claim 63. (new) The device of claim 59 wherein the modified urease is a blend of urease and zirconium oxide, the urease present from about 0.1% to about 0.2% by weight of the blend.